Space Weather Forecast

Issued on Friday, 24 May 2024 at 13:06 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor radio blackouts (R1) likely throughout. Slight chance minor geomagnetic storms (G1): mainly UTC nights Friday into Saturday, also Sunday into Monday.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate, with occasional Moderate-class X-ray flares observed. The source region for these flares has become more diverse relative to earlier in the week, with the largest at 23/1320UTC still from the same complex spot group in the southwest - as in recent days - but with Moderate-class contributions also seen from spots further east.

There are now six sunspot regions on the facing side, with a new magnetically unipolar group in the northeast arriving. Analysis of the large southwestern group is now becoming more difficult as it approaches the southwestern solar horizon (due to the viewing angle), however it appears to have shrunk slightly in its central spots.

Other spot groups appeared to show little change in visible light, with slow movement in peripheral spots generally the main observation.

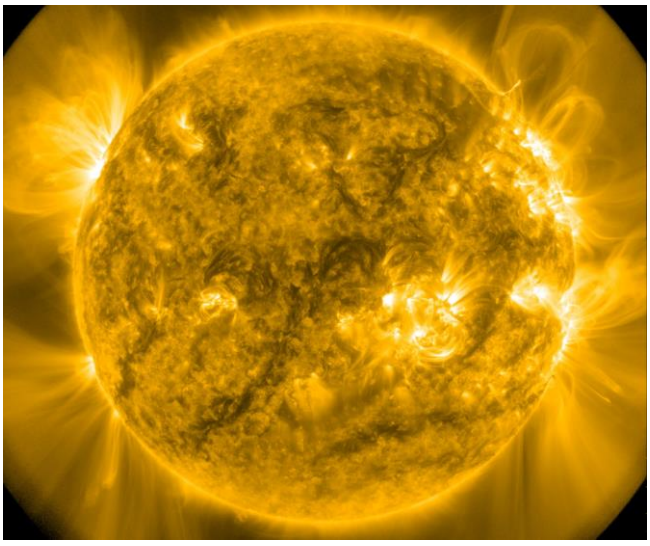

Figure 1: False-colour 24/1130UTC Extreme UV imagery – a proxy for mangentic field lines emanating from sunspot regions. Note that as well as the offgoing southwest activity (lower right), there is eveidence on the northeastern solar horizon, perhaps indicating returning regions here. The southeast is likely to reveal similar structure later in the coming UTC weekend, ahead of the probable gradual arrival on Monday 27 May of the large extreme geomagnetic storm-producing sunspot group (although its continuing potency is not yet assured).

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There have continued to be numerous Coronal Mass Ejections (CMEs) visible on satellite imagery. A re-analysis was undertaken of the 'filament' (arc of plasma) activity from the southeast between 23/0600-0630UTC (i.e. prior to the current reporting period). The latest MOSWOC modelling suggests part of this ejecta is directed below Earth to no effect, but a second lobe shows a possible glancing blow of Earth overnight Sunday 26 in Monday 27 May UTC. CME activity in the current 24-hour period has not yielded further potentially Earth-directed CMEs, however confirmatory imagery is awaited.

At the very end of the reporting period (around 24/1130UTC) an energetic filament eruption was observed from the northwest. Imagery is awaited, although provisionally impacts are not expected from this location.

Solar Wind / Geomagnetic Activity: Solar winds have been indicative of ongoing slow wind conditions. The solar wind speed was within background levels on a near-level trend. The number of particles in the wind was within background levels, but perhaps highest around the middle of the reporting period. The associated magnetic field rose slightly from background to slightly elevated levels. The north-south component was mainly anti-aligned with Earth's field (usually to greater geomagnetic effect) and of larger magnitude than any co-alignment. The net result of the above solar wind measures was an overall provisional rise from quiet conditions, albeit falling short of minor geomagnetic storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, despite potentially productive Moderate-class X-ray flares in the southwest.

Four-Day Space Weather Forecast Summary

Solar Activity: Isolated Moderate-class flares remain possible each day, and a slight chance of rising to Strong-class. These are most likely from the sunspot group in the southwest, but two large returning regions may also begin to contribute inside 24 hours' time - with their potency to be confirmed. The very large and active sunspot that produced the Extreme geomagnetic storm of 10-11 May is then due on Monday 27 May. There is some evidence for this region to have remained a potent sunspot group (inferred from far-side CME activity visible from near-Earth satellites), and X-ray flare risks therefore show a definite uptick on the final day of the period.

Solar Wind / Geomagnetic Activity: Southeast-central filament activity from 0600-0630UTC 23 May has resulted in a possible glance from a CME during the UTC overnight period Sunday 26 into Monday 27 May. Confidence in this is notably low. No other CMEs feature, although note there are unassessed candidates.

The 'coronal hole'-based forecast also carries low confidence due its reliance on newly-emerged fast wind generating features in the month since this part of the Sun last faced Earth. There is perhaps a slight chance of G1 from a coronal hole in the next 24 hours, and perhaps a smaller risk again from a second hole at the very end of the four days.

Both the above mechanisms combine to give a slight chance of G1 on all days, with the risks highest in the coming UTC night (straddling Friday and Saturday) and again in the UTC night straddling Sunday and Monday - with a respectively mainly 'coronal hole-driven' and then 'CME-driven' rationale.

Energetic Particles / Solar Radiation: Solar radiation storms are considered a daily slight chance should any Moderate or Strong flares materialise. The chance of this occurring is expected to gradually reduce late in the forecast period as the larger spot groups reach the far

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side. Any surviving portion of the very large G5-producing sunspot group is likely to be too far east to present any significant risk of S-scale events from Monday 27 May.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	10	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	50	70
Very Active	R3 to R5 X	No	5	5	5	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	15	15	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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